Attorney Docket # 502901-433PUS

Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of
Torsten WAHLER et al.
Serial No.: 10/537,905
Filed: June 6, 2005
For: Gearing

Examiner: Pang, Roger L.
Group Art: 3681

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Commissioner for Patents
P.O. Box 1450
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SUPPLEMENTAL APPEAL BRIEF

SIR:

This is an appeal, pursuant to 37 C.F.R. § 41.37 from the decision of the Examiner in the above-identified application, as set forth in the Final Office Action of March 26, 2008, wherein the Examiner finally rejected Appellant's claims. The rejected claims are reproduced in the Appendix A attached hereto. A Notice of Appeal was filed on August 26, 2008.

The fee of $540.00 for filing an Appeal Brief pursuant to 37 C.F.R. §41.20 was previously submitted.

REAL PARTY IN INTEREST

The assignee, Siemens Aktiengesellschaft, of applicant, Torsen Wahler, is the real party of interest in the above-identified U.S. Patent Application.

RELATED APPEALS AND INTERFERENCES

There are no other appeals and/or interferences related to the above-identified application at the present time.

STATUS OF CLAIMS

Claims 2 and 3 have been cancelled. Claims 1 and 4 have been finally rejected. Claims 1 and 4 are on appeal.

STATUS OF AMENDMENTS

A Request for Reconsideration was filed on May 29, 2008 subsequent to the March 26, 2008 Final Office Action. In response, on June 16, 2008, the Examiner maintained his rejections.

SUMMARY OF THE CLAIMED SUBJECT MATTER

Appellant's invention of CLAIM 1 is directed to a gearing (see FIG. 1 and pg. 1, line 1 of the specification as originally filed).

The claimed gearing comprises a fixed, internally toothed internal gear (1) (see FIG. 1 and pg. 4, lines 24-25 of the specification as originally filed),

an annular, flexible toothed band (2) arranged so as to engage with the toothing of the internal gear (1) (see FIG. 1 and pg. 4, lines 25-26 of the specification), where the toothed band (2) has fewer teeth than the internal gear (1) (see FIG. 1 and pg. 5, line 5 of the specification);

a rotatable wave generator (3) arranged to transmit a force to the toothed band (2) via a tappet gear (4) such that a relative motion of the toothed band (2) with respect to the internal gear (1) results from a rotation of the wave generator (3) (see FIGS. 1, 2 and pg. 4, line 32 to pg. 5, line 2 of the specification),

a mating gear (7) (see FIGS. 2 and 4, and pg. 5, lines 14-16); and

driving pins (5) shaped on a lateral face of the toothed band (1) and arranged to engage in recesses (6) in the mating gear (7) (see FIG. 3, pg. 2, lines 25-26 and pg. 5, lines 24-30 of the specification).

In the claimed gearing, axes of the wave generator (3) and the mating gear (7) are parallel, and the recesses (6) in the mating gear (7) are radially extending grooves (6) (see FIG. 2 and pg. 6, lines 1-3 of the specification),

a difference (x) between the outer edge (11) and the inner edge (12) on a circular arc does not equal zero (see FIG. 5 and pg. 6, lines 27-30 of the specification), and

the difference (x) is selected so that an outer distance between opposing outer edges (11) of a groove (6) is larger than an inner distance between opposing inner edges (12) of the groove (6) (see FIG. 5, pg. 6, lines 27-30 of the specification).

GROUNDS OF REJECTION TO BE REVIEWED IN APPEAL

1. Whether claim 1 is patentable under 35 U.S.C. §103(a) over U.S. DE 40 38 555 ("*Fischer*") in view of U.S. Patent No. 5,779,551 ("*Stall*")?

2. Whether claim 4 is patentable under 35 U.S.C. §103(a) over *Fischer* in view of *Stall*, and further in view of U.S. Patent No. 6,220,115 ("*Hirn*")?

ARGUMENT

1. INDEPENDENT CLAIM 1

The combination of *Fischer* and *Stall* fails to teach or suggest "wherein a difference between the outer edge and the inner edge on a circular arc does not equal zero" and "wherein the difference is selected so that an outer distance between opposing outer edges of a groove is larger than an inner distance between opposing inner edges of a groove", as expressly recited in independent claim 1. That is, the combination fails to disclose that the width of each groove increases in the radial direction, as shown in FIG. 5 of the instant invention.

The annotated Figures (Figs. 2 and 4 of *Fischer*) represented below support Appellant's arguments that follow.

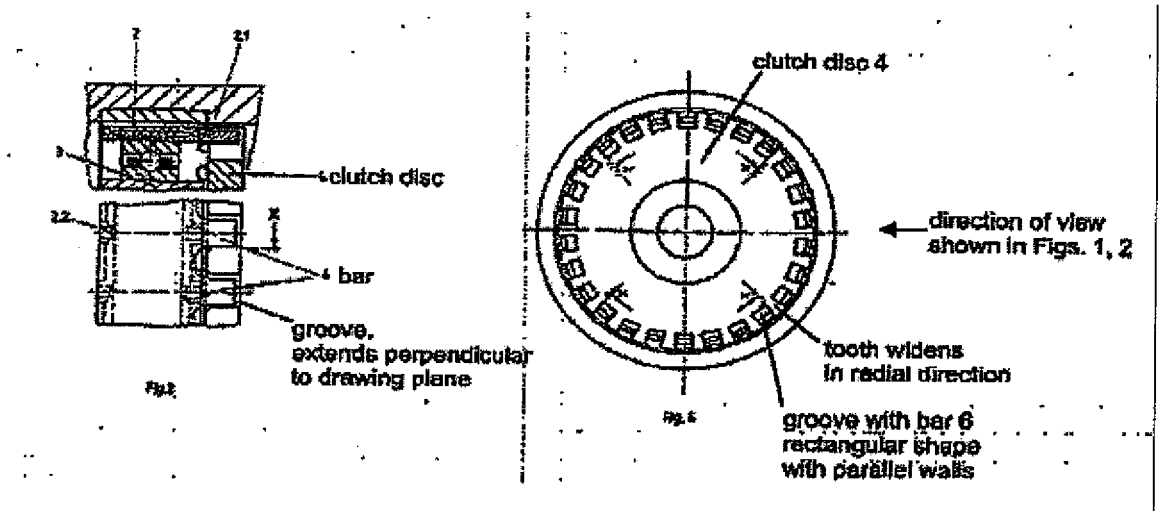

FIG. 4 of *Fischer* shows that the width of each tooth between the grooves of the clutch disc 4 increases in the radial direction. FIG. 4 is therefore consistent with the description in paragraph 18 of the English translation of *Fischer*[1]. In addition, FIG. 4 shows that each groove has a rectangular shape with parallel walls. Furthermore, each groove is configured to receive clutch bars 6, as shown in FIG. 2.

[1] Appellant has attached herewith an electronic translation of the *Fischer* patent.

The width of the teeth shown in the structure of *Fischer* increase in the radial direction, but the width of the grooves does not increase. In such grooves, the outer distance between opposing outer edges of the groove is the same as the inner distance between opposing inner edges of the groove. That is, the walls of the groove are at a fixed distance, i.e., parallel, as shown in FIG. 4 of *Fischer*.

Accordingly, *Fischer* fails to disclose, teach or suggest "wherein a difference between the outer edge and the inner edge on a circular arc does not equal zero" and "wherein the difference is selected so that an outer distance between opposing outer edges of a groove is larger than an inner distance between opposing inner edges of a groove", as expressly recited in independent claim 1.

Moreover, independent claim 1 further recites that driving pins engage in recesses in the mating gear. Under the Examiner's proffered analysis of *Fischer*, the clutch bars 6 of FIG. 4 constitute Appellant's claimed driving pins. In actuality, however, the clutch bars 6 of *Fischer* engage with the grooves of the clutch disc 4, as explained in *Fischer* at paragraph [0018], lines 7-8 of the English translation (also see FIGS. 2 and 4). Appellant respectfully directs attention to the rectangular grooves and radially widening bars 6 (driving pins) shown in FIG. 4 of *Fischer*. The arrangement depicted therein does not show driving pins that engage in recesses of a mating gear, since the clutch disc 4 is not a "mating gear" within the meaning and scope of the claimed invention.

The Examiner (at pg. 2 of the June 16, 2008 Advisory Office Action) asserts that FIG. 2 of *Fischer* discloses clutch bars 6 (i.e. driving pins) that are always flat, and that the indentations between which they connect (i.e., radially extending grooves of the clutch disk that allegedly corresponds to Appellant's claimed mating gear) can be flat (i.e. have parallel sides),

trapezoidal or have a pointed tooth profile. The Examiner further asserts that the indentations depicted in FIG. 4 of *Fischer* are trapezoidal in form. According to the Examiner, *Fischer* explains that the grooves can have a pointed tooth profile and *Stall* (discussed subsequently) shows the form of the pointed tooth grooves, where the outer distance between opposing outer edges is larger than an inner distance between opposing inner edges (FIG. 4a). Moreover, the Examiner asserts that that even if it were true that Appellant's interpretation of the "indentation" described in *Fischer* corresponds to the gear teeth profile, a trapezoidal or pointed tooth profile would still yield the same grooves as claimed. Appellant respectfully disagrees.

As discussed above, the trapezoidal tooth profile shown in FIG. 4 yields rectangular shaped grooves. Furthermore, there is nothing whatsoever in *Fischer* with respect to Appellant's claimed structure. Absent an express description or illustration in *Fischer*, the skilled person is thus provided with no basis to form an opinion with respect to what *Fischer* means when referring to a "flat" or "pointed" tooth profile. That is, there is no teaching or suggest of any structure that is flat or pointed, or any specific "directional" orientation of the disclosed structure. Indeed, there is no disclosure, teaching or suggestion whatsoever of any resulting groove, or whether such a groove would in fact meet the express limitations of independent claim 1.

The Examiner cites *Stall* as a secondary reference as an evidentiary teaching of grooves that meet Appellant's express limitations of independent claim 1. Regarding the shape of the groove, the Examiner refers to *Stall* Fig. 4a, which shows a series of inner teeth 4 opposite a series of shaft teeth 2. The Examiner in the Advisory Action emphasizes this teaching of *Stall* corresponds to grooves with a pointed tooth profile (i.e., the inverted form of the trapezoidal groove shown in *Fischer*). However, the inner teeth 4 and shaft teeth 2 of *Stall* fail to disclose

"radially extending grooves" on a mating gear as recited in independent claim 1. Instead, the Examiner-referred teeth of *Stall* are analogous to the internal gear and external toothed band of claim 1.

Furthermore, each series of teeth shown in *Stall* is a sinusoidal structure, wherein neighboring peaks are separated by a wave trough and capped to form the teeth. The sinusoidal structures are offset from each other so that a tooth extends into an opposite wave trough. The series of teeth disclosed in *Stall* do not possess grooves that meet the limitations of independent claim 1. Moreover, even assuming, *arguendo*, that the wave troughs of *Stall* are grooves, each of these grooves has only an outer edge but no inner edge. As depicted in FIG. 4a of *Stall*, the bottom of the wave trough does not have an edge. Consequently, *Stall* fails to teach or suggest a groove having an outer edge and an inner edge, as well as the additional requirement regarding the claimed difference between these edges. Therefore, the combination of *Fischer* and *Stall* fails to achieve the express recitations of independent claim 1, because *Stall* fails to provide what *Fischer* lacks.

For the foregoing reasons, it is respectfully submitted that the combined teachings of *Fischer* and *Stall* fail to establish a *prima facie* case of obviousness with regard to the subject matter recited in independent claim 1. The Final Rejection of independent claim 1 should be reversed.

2. DEPENDENT CLAIM 4

The Examiner (pg. 4 of the Final Office Action) acknowledges the combination of *Fischer* and *Stall* fails to teach the use of "injection-molded plastic", as cited in dependent claim 4. Hirn has been cited to provide this teaching.

Hirn relates to a step-down gear system that achieves a higher degree of efficiency, a play-free engagement and greater gear reduction or higher speed reduction ratios, while minimizing frictional losses. However, *Hirn* fails to teach or suggest the teeth or grooves recited in independent claim 1. Moreover, absent impermissible hindsight based on Appellant's disclosure the skilled person is provided with no reason to modify the teachings of *Fischer* and/or *Stall* to achieve the structure recited in independent claim 1. For this reason and because of the additional inventive features recited in dependent claim 4 that depends from claim 1, Appellant submits that dependent claim 4 is patentable.

For the foregoing reasons, it is respectfully submitted that the combined teachings of *Fischer*, *Stall* and *Hirn* fail to establish a *prima facie* case of obviousness with regard to the subject matter recited in claims. The Final Rejection of dependent claim 4 should be reversed.

CONCLUSION

For the foregoing reasons, it is respectfully submitted that Appellant's claims are not rendered obvious by *Fischer*, *Stall* and/or *Hirn* and are, therefore, patentable over the art of record, and the Examiner's rejections should be reversed.

Respectfully submitted,
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CLAIMS APPENDIX

1. A gearing comprising:

a fixed, internally toothed internal gear;

an annular, flexible toothed band arranged so as to engage with the toothing of the internal gear, the toothed band having fewer teeth than the internal gear;

a rotatable wave generator arranged to transmit a force to the toothed band via a tappet gear such that a relative motion of the toothed band with respect to the internal gear results from a rotation of the wave generator,

a mating gear; and

driving pins shaped on a lateral face of the toothed band and arranged to engage in recesses in the mating gear,

wherein axes of the wave generator and of the mating gear are parallel,

wherein the recesses in the mating gear are radially extending grooves,

wherein each groove has an outer edge and an inner edge,

wherein a difference between the outer edge and the inner edge on a circular arc does not equal zero, and

wherein the difference is selected so that an outer distance between opposing outer edges of a groove is larger than an inner distance between opposing inner edges of a groove.

2. - 3. (Canceled)

4. The gearing according to claim, wherein the gearing components are plastic injection-molded parts.

EVIDENCE APPENDIX

Copy of electronically generated English translation of DE 40 38 555

Result Page

State of the art

State of the art

[0001] The invention refers to a reduction gear in accordance with in the preamble of the claim 1. indicated features.

[0002] Transmission with the principle of a flexible wheel of which in a ring gear rotates is as voltage wave transmission after Pat. - NR. 29 44 123 F 16 H 25/06, planetary gear after DE 37 38 521 c1 and make Harmonic drive system known. The output made after different solutions, on the one hand with a ring gear same number of teeth of the flexible wheel, or with a sun gear within the flexible wheel also with same number of teeth, or however with a topfförmigen flexible wheel with output at the flange of the pot.

[0003] These known proposals have the drawback that the flexible wheel must be more prolonged by a pot formation around the teeth of the output gear or and so that an high deforming work is in the operation necessary.

[0004] With output over a sun gear the meshing 90 is degree offset to the flexible wheel and must additional supported become thereby the system overloaded does not become.

[0005] The production paired teeth is expensively, all the more if play reduction required becomes.

[0006] The same applies to the known pot form with necessary resistance to buckling with thin wall.

[0007] The requirements adapted inexpensive material choice z. B. fiber reinforced high speed plastics formed or synchronous toothed belt employment is not with known solutions possible.

Object

[0008] Object of the invention is it to create a reduction gear after the preamble of Claim 1 with which the transmission is provided with the subsequent advantages, how an axial output, which becomes neither strained nor warped and makes also no additional circumferential teeth - outer or interior necessary, which is inevitably not free from play.

To arrange plug-in as transmission installation period the impulse members.

The drift moments with several flanks by means of surface loading on a stable clutch disc to transmitted.

The deforming and becoming baggy work to reduce by a short deforming case as case wheel, with its teeth tuned on the width of the internal gear teeth, becomes designed after which the transmission.

By a material choice of teeth tuned on the transmission use one receives an inexpensive high transmission with teeth from FVK or with synchronous toothed belts.

[0009] Solution of the object becomes the corresponding characterizing portion of the claim 1 disengaged.

[0010] Thereby results a reduction gear of simple construction with few components compact embodiment, whose kit finds economical use as wave transmission, hollow shaft transmission, hub transmission in mechanical engineering, tool-making, automation technology, Fahrzeugbaug.

[0011] Other embodiments of the invention are to be taken from the subsequent description and the Unteransprüchen.

Auführungsbeispiel

[0012] The invention becomes appended on the basis the embodiment shown represented in the accompanying images. It shows

[0013] Fig. 1 an axial section by the transmission,

[0014] Fig. 2 an enlarged section in plane of Fig. 1 with ball bearing,

[0015] Fig. 3 a cross section in plane A-A,

[0016] Fig. 4 a cross section in plane B-B,

[0017] Fig. 5 a section in plane of Fig. 1 with eccentric discs.

[0018] The represented transmission places underneath an input speed, as after the known principle a flexible outer spline case wheel (2) in a ring gear (1) rotates, because a cam disc (3) with 2 Hochpunkten into one another-pushes opposite teeth onto 180 degree of the center outward, becomes the case wheel (2) radial deformed, as a rolling bearing (5) rotates friction-poor, with high speeds as special thin ring grooved ball bearing. Alternative one to this known solution becomes by means of a double eccentric cam (10), ball bearing (11) and discs (12) the case wheel (2) radial deformed, with which the rolling moment of the bearings becomes reduced by the rotating diameter smaller thereby. The case wheel (2) possesses, uniform at the circumference divided, clutch bars (6), which reach into grooves of the drift dome disk (4). These grooves are wider as the dome bars (6), around the measure like the case wheel (2) radial deformed become with the circulation of the cam disc (3). The deformation radial corresponds to tangential shifting of the dome bars (6), in the range (X) of each quadrant rests the bars against the grooves of the clutch disc (4) laminar and the transmitted tangential forces. The transmission drift can become by the slot-wide intended with backlash, play-poor, free from play or with bias set. The dome bars (6) can become also as bolt executed, however to transmitted bolts substantial smaller tangential forces than bars, whose width for the calculation of the resistive torque goes into the square, thus receive one with the suggested solution an high rigidity

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and a moment transferability, whose values correspond from planetray gear transmissions in the output. The case wheel (2) can become ganzteilig made of steel or as hybrid part designed, as the body (2.1) consists and the clutch bars (6), connected thereby, of steel, which teeth formed is drawn up will with fiber reinforced plastic, or but a suitable synchronous toothed belt direct on the body (2.1), whole on the intended use and price of the gear construction set of tuned. The number of the clutch bars (6) amounts to as even number approx. 1/3 of the external teeth teeth of the Hülsenrades (2). As teeth a flat, trapezoidal or pointed tooth profile with small division is favourable, in order to hold the transmission diameter small.

RELATED PROCEEDINGS APPENDIX

NONE